Using XAFS to Study the Interaction of Plutonium on Manganese Oxide Hydroxide Mineral Surfaces

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Several U.S. DOE sites have been contaminated by transuranic radionuclides (TRU). To understand the transport of these TRU in the vadose zone, interfacial reactions of plutonium with manganese oxide/hydroxide mineral surfaces are currently being investigated. Manganese oxides, present as minor phases in the vadose zone, can preferentially sequester TRU over iron oxide/hydroxide minerals present in larger amounts. To understand the interactions between plutonium and manganese oxyhydroxides, the sorption of plutonium ions in well-defined oxidation states on well-characterized mineral surfaces as a function of pH, actinide concentration, and ionic strength have been investigated. The oxidation state of the sorbed plutonium and the local structure of the metal sorption complexes have been determined using X-ray absorption fine structure (XAFS). Ultimately, this data will be used to develop surface complexation models in an attempt to predict TRU migration in the vadose zone to nearby water supplies.